NOMINAL ANCHOR EXCHANGE RATE
POLICIES AS A DOMESTIC DISTORTION

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ABSTRACT

This paper analyzes a nominal anchor exchange rate policy as a domestic distortion, in the tradition of international trade theory. It is shown that, in addition to the problems of sustainability and exit pinpointed in the exchange rate literature, a nominal anchor exchange rate policy, while in force, drives a wedge between the domestic and the international intertemporal marginal rates of substitution. The welfare cost of the Mexican use of the nominal anchor exchange rate policy prior to December 1994 is then estimated.

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AS A DOMESTIC DISTORTION[1]

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For policy makers confronted with crisis situations involving triple-digit rates of inflation, inability to maintain voluntary debt service, and highly protectionist trade regimes, a frequent policy prescription has been to adjust the underlying fiscal imbalance and to undertake a once-and-for-all devaluation; thereafter, the exchange rate should be used as a "nominal anchor" for slowing down the rate of inflation.[2] This could be achieved by maintaining a fixed nominal exchange rate (despite continuing inflation) or by preannouncing a schedule of mini-devaluations at a rate below the rate of inflation.[3]

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[2] The anchor could be a fixed exchange rate or it could function with relatively frequent, but small (relative to the pre-ceeding rate of inflation) adjustments, which would then diminish in size as the inflation rate fell.

[3] These devaluations would need to be sufficiently small to avoid providing incentives for speculation.

Simultaneously, other policy reforms would be undertaken or begun in order to alter the structure of the economy.[4] Among these other reforms, an important one would be a realignment of the trade and payments regime in order to move away from restrictive protectionist policies and toward a more outward orientation. This would normally entail the removal of quantitative controls over imports and a reduction, or an announced schedule of reductions, in the rate of protection for import-competing goods.

The nominal anchor exchange rate policy has been advocated primarily by macroeconomists who, on the premise that the demand for real money balances may be unstable or unpredictable in the aftermath of a triple-digit (or more) inflation rate, argue that the predetermined time path of the nominal exchange rate will "anchor" the price level and therefore inflationary expectations.[5]

It is the purpose of this paper to view a nominal anchor exchange rate policy from a different perspective: that of international economics. It will be argued that, just as a tariff creates a distortion and an associated welfare cost by driving a wedge between the domestic and international marginal rates of substitution and transformation, so a nominal anchor exchange rate

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[4]In a serious reform program, support is forthcoming from the international financial institutions (IFIs) and debt servicing obligations are normally rescheduled. Thus, any "balance of payments" or "debt" crisis that triggers policy reform can normally be eased if other policy reforms meet the criteria of the IFIs.

[5]This argument presupposes that the announced monetary and fiscal reforms are insufficiently credible by themselves to alter expectations, and that the reforms-cum-nominal-anchor will in fact achieve the result.

policy creates a distortion by driving a wedge between the domestic and the international intertemporal rate of substitution. Once the case is made, estimates of the cost of the nominal anchor exchange rate policy in the case of Mexico are presented.

Even if there were no welfare costs associated with the distortion created by a nominal anchor exchange rate policy, a number of serious questions arise as to their potential usefulness. A first section reviews some of these issues. A second section then analyzes a nominal anchor exchange rate policy from the perspective of trade theory, in light of the dual objectives of inflation reduction and of restructuring production toward exportables and away from import-competing goods. A third section provides the analysis of nominal anchor exchange rates as a distortion. A final section then applies the analysis to the Mexican experience from the late 1980s until the December 1994 devaluation.

1. Nominal Anchor Exchange Rate Policies in Macroeconomic Perspective.

Variants of a nominal anchor exchange rate policy have been used on many occasions. In the late 1970s, the "Southern Cone" countries of Argentina, Chile and Uruguay, all adopted "tablitas" indicating the future paths of the nominal exchange rates, with depreciations at rates less than the prevailing rates of inflation.[6] These policies were undertaken in the hope of bringing

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[6]If one were to follow a purchasing power parity rule, the appropriate rate of depreciation would be the differential between the domestic rate of inflation and the worldwide rate of inflation (with any necessary adjustments for the difference between the world price level and the price index relevant for

the rate of inflation down, on the reasoning that the "law of one price" would prevent the domestic price level from rising as rapidly as it otherwise might.[7]

In the 1980s, additional countries have undertaken these policies. Mexico began a variant of the nominal anchor policy starting in 1987, after which the maximum rate at which the peso would be permitted to depreciate was negotiated in a pact with the labor unions - the maximum permitted rate of depreciation always being considerably below that warranted by purchasing power parity as determined by the then-prevailing inflation rate differential between Mexico and the rest of the world. Israel relied on a nominal anchor exchange rate policy for the first several years of the stabilization program begun in 1985. And, most recently, Argentina has adopted an extreme form of such a policy, with an absolutely fixed exchange rate[8], while Brazil is following a much looser version of the same policy.

Since, by definition, a nominal anchor exchange rate policy

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the country's trade. For a discussion of the Chilean and Mexican experiences with exchange-rate based stabilizations, see Edwards (1996).

[7] In any use of a nominal anchor exchange rate policy, there is an issue as to whether the underlying fiscal-monetary adjustments are sufficient to bring down the rate of inflation. All analysts agree that a nominal anchor exchange rate policy in the absence of a sufficient macroeconomic shift will fail.

[8] It may be objected that the Argentine policy is different, because the money supply by law is determined by the supply of foreign exchange. However, the rate of inflation in Argentina has been above the dollar rate of inflation; to date, measures such as tax exemptions and subsidies have offset much of the appreciation of the real exchange rate that would otherwise have occurred.

4

entails real appreciation of the currency, it is clear that an "exit policy" is necessary if a long-run successful outcome is to be achieved. Following the policy "too long" will clearly result in difficulties as it becomes recognized that increasing currency overvaluation is resulting in depletion of foreign asssets; at that point, the bubble will burst, and the results of the anti-inflationary program will be at least partially undermined by the maxidevaluation that must inevitably follow.[9] The difficulties of achieving an appropriate exit are widely recognized, and many economists have questioned the advisability of a nominal anchor exchange rate policy on that ground alone.

A second difficulty arises because it is clear that a nominal

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[9]It might be argued that one could start with a devaluation sufficient to <u>undervalue</u> the exchange rate initially, and that the nominal anchor policy could be engineered such that it would end with inflation converging to the world rate and a fixed exchange rate after exactly the right amount of real appreciation had occurred. Many Mexican policy makers did argue that the 1987 devaluation resulted in such an undervalued real exchange rate.

A question of interest, if this policy were deliberately chosen, is the extent to which the initially greater devaluation would lead to a larger increase in the price level than would occur under a policy of shifting to an initially appropriate rate; and whether that once-and-for-all increase in the price level was greater or less than the subsequent reduction that would presumably occur because of the nominal anchor exchange rate policy.

It should also be noted, however, that there is an additional difficulty: just as the demand for real money balances cannot be accurately predicted following a shift in inflationary expectations, so too it is difficult to estimate the appropriate "real exchange rate" if the objective is to alter the restrictionist trade and payments regime. Since, usually, historical evidence covers only a period during which import substitution policies were followed, there is little to guide policy makers as to the appropriate real exchange rate once trade is liberalized. A suggested alternative exchange rate policy focus is given in Krueger (forthcoming).

anchor exchange rate policy can succeed only if the underlying fiscal-monetary policies of the country are consistent with the eventual reduction in the rate of inflation anticipated by the nominal anchor exchange rate policy. If they are, one can also question whether the nominal anchor policy itself is necessary, although proponents, as already noted, conclude that the nominal anchor policy leads to a more rapid deceleration in the rate of inflation than would otherwise occur.

Finally, if the opening of the trade and payments regime is undertaken in order to alter the structure of the economy and induce producers to shift from import-competing to exportable production, one has to ask how expectations of the sustainability of the policy will be affected by simultaneous announcement of a policy which entails gradual real appreciation of the currency.

The need for exit, the apparent contradiction between attempting to pull resources into exportable production and real appreciation, and the necessity for fiscal-monetary consistency each raises considerable doubts as to the wisdom of a nominal anchor exchange rate policy.

For purposes of this paper, however, these issues are overlooked and it will be posited that the nominal exchange rate adjustments over a considerable period fall short of the domestic rate of inflation and that foreign reserves are sufficient during that interval to deter speculation against the currency.[10] Thus, it

[10]An important question that is not addressed here deals with why individuals would not anticipate the unsustainability of a nominal anchor policy and hence attempt to sell the local

6

is assumed that agents are sufficiently myopic, or otherwise convinced (perhaps because they believe that a "rescue" operation may be mounted by international agencies or interested foreign governments) that the exchange rate regime can be maintained for the period of time for which the analysis pertains.[11]

2. Nominal Anchor Exchange Rates and Trade Policies

Calvo, Reinhart and Vegh (1995) give a good, brief statement of the rationale for use of a nominal anchor exchange rate policy:

"In an open economy, either the money supply or the nominal exchange rate can serve as a nominal anchor. Such an anchor is usually viewed as a necessary condition for macroeconomic stability since, at least in the long run, all nominal variables will converge to the pre-set rate of growth of either the money supply or the exchange rate. Assuming that appropriate fiscal and microeconomic policies are in place, the price stability brought about by a nominal anchor should ensure that the economy achieves long-run economic growth."[12]

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currency, thus bringing about an end to the policy regime. It might be argued that the real puzzle regarding nominal anchor exchange rate policies such as that pursued by Mexico is not why they collapsed, but why they lasted as long as they did.

[11] A sufficiently high real return to foreigners generated by the nominal anchor exchange rate policy can provide sufficient inducement to hold local currency provided that reserve levels are adequate to reassure most agents that the nominal anchor policy has a good chance of surviving over the intermediate run. Of course, the inducement to hold is greater, the greater the rate of real appreciation. The greater the (cumulative) real appreciation, however, the larger will be the reduction in the current account balance.

[12] Calvo et al (1995), Pp. 97-98.

A second argument in support of a nominal anchor exchange rate policy relates to the difficulties that can arise when the authorities attempt to target the "wrong" real exchange rate. Clearly, an inappropriate real target could result in inflation or deflation as the nominal exchange rate was repeatedly altered to maintain an inappropriate real level.

Bruno and Fischer (1990) have also defended use of a nominal anchor exchange rate policy. They base their argument on the possible existence of multiple equilibria and the need for a nominal anchor in order to avoid a higher equilibrium inflation rate than is necessary, given the underlying fiscal-monetary stance of the economy.[13]

Other arguments in support of nominal anchor exchange rate policies have been made, but without the same degree of analytical rigor. Chief among these is the "inertial" inflation argument. Some have claimed that there is an "inertial" component in inflation, and that use of a nominal anchor exchange rate can result in a more rapid convergence of the rate of inflation to the new, underlying rate consistent with fiscal and monetary reforms, than would otherwise occur.[14]

Under the nominal anchor exchange rate policy, the rate of

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[13]Bruno and Fischer (1990), P. 373.

[14]This was the rationale for the three Southern Cone "nominal anchor" exchange rate policies in the late 1970s. See Corbo and de Melo (1987) for particulars. It was also the rationale for the "cruzado" plan in Brazil in 1986. Finance Minister Pedro Aspe (1993) also used it in defending Mexican exchange rate policies.

nominal devaluation and possibly its timetable is preannounced[15] at a rate below the prevailing rate of inflation. Alternatives traditionally ofered to a nominal anchor exchange rate policy include floating, a "crawling peg" where adjustments are undertaken to keep the rate at purchasing power parity with major trading partners, and a currency board.[16]

Under a crawling peg, there would be adjustments in the exchange rate equal to the differential in inflation rates at sufficiently frequent intervals to reduce the profitability of speculation against these changes.[17] Under a currency board, the exchange rate is rigidly fixed and the supply of money is determined by foreign exchange holdings.[18] Under any of these alternative policies, the nominal money supply would, of necessity, provide the "nominal anchor". As already mentioned, the objection to that policy has been that, in the context of a high inflation,

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[15]The preannounced rate may be a maximal permissible rate (as was the case in Mexico), when the exchange rate is permitted to float within a band. It may instead be a timetable of rates, as was the case in the Southern Cone.

[16]Another possibility is to follow a PPP rule with adjustments in the real exchange rate (by smaller or greater nominal exchange rate changes) as the growth of export earnings falls short of or exceeds an estimated target rate. See Krueger (forthcoming) for the argument.

[17]The theoretical objection to a crawling peg exchange rate policy is that, if the authorities target the "wrong" real exchange rate, the domestic price level will be destabilized.

[18]In most regards, a currency board can be regarded as a nominal anchor exchange rate policy. If it is truly 100 percent backing of the domestic money supply, the policy can become fully credible, although issues regarding the treatment and performance of the tradables sector during the transition may still arise.

policy makers cannot know what the behavior of the demand for real balances will be once the rate of inflation begins to drop. Hence, so the argument goes, they run the risk either of curtailing the money supply too sharply (thus inducing very high nominal -- and real -- interest rates) or of permitting too large a money supply (if they overestimate the demand for real balances at lower rates of inflation).

Before turning to the analytics of a nominal anchor exchange rate policy on incentives for trade and capital flows, several aspects of the need for reforms in the trade and payments regime should be noted. As was already pointed out, the impetus to policy reforms usually arises both from the high and usually accelerating rate of inflation and difficulties with the trade and payments regime. While symptoms of these difficulties are normally the inability to maintain voluntary debt service and/or increasing restrictiveness of import licensing regimes, it is now generally recognized that highly restrictive trade and payments regimes are not consistent with satisfactory rates of economic growth over the longer term.[19]

The links between the trade regime and growth are many, and need not be of concern here, except to note that policy reforms are almost always designed, among other things, to open up the trade regime, reducing the bias against exports.[20] The initial situation

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[19]World Bank, (1993).

[20]The bias of a trade regime (in favor of import-competing activiites) is normally defined as the difference between the domestic ratio of prices of import-competing to exportable goods

before reforms is one in which exports have for years been discouraged by currency overvaluation, high prices for domestically-produced intermediate goods relative to the international prices received for exports, and the disincentives arising from protection to import-competing sectors. Moreover, businessmen are accustomed to a sheltered domestic market with the lack of risk, monopoly power and prospect of assured returns that normally brings.

To achieve a more efficient allocation of resources and basis for growth, therefore, the bias of the trade and payments regime must be reduced and producers must be convinced that the relative profitability of exporting has increased significantly. If they are so convinced, the normal expectation is for <u>both</u> exports and imports to grow more rapidly than output as producers respond to the altered incentives.

Thus, at a theoretical level, policy reform should entail a realignment of incentives by undertaking policies which result in a <u>depreciation</u> of the real exchange rate to a level that makes exporting considerably more attractive than under the ancien regime.

A realistic real exchange rate is an essential prerequisite for such a strategy to succeed, especially in light of earlier histories of strong discrimination against exports. With those

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and the international ratio of exportable to importable prices. In analysis of actual trade regimes, of course, both the average level of domestic and international prices, an the variance in protective rates, are important.

histories, potential entrants to export markets must be convinced that the altered incentive regime will persist before investing the resources and efforts necessary to develop export markets.[21] It is certainly evident that a nominal anchor exchange rate policy, leading as it inevitably does while it persists to appreciation of the real exchange rate, provides assurances to potential exporters that, whatever the real return in local currency to exporting might be today, it will be less so in the future. Thus, even if the initial maxidevaluation results in a real exchange rate that would -- if maintained -- encourage the desired resource reallocation from import-competing to exportable activities, doubts about its future path might in themselves dissuade producers from the necessary investments.[22]

3. Analytics of Nominal Anchor Exchange Rate Policies

A nominal anchor exchange rate policy by definition does several things. It alters the relationship between the price of tradables and the price of home goods over time, and it affects relative returns to foreigners and domestic residents on the holding of domestic assets.

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[21]See, for example, Krueger (1992) and Edwards (1989).

[22]To be sure, there may be "excess capacity" exports that occur in the aftermath of a devaluation, especially when domestic demand falls after the introduction of a stabilization-reform program. Even then, however, resources normally need to be invested in exploring foreign markets, developing the necessary distribution channels, and so on. However, a sustained growth of exports of the kind that will "rebalance" economic activities between exportable and import-competing production requires investment in plant and equipment that is not likely to be forthcoming when the real exchange rate is expected to appreciate.

By driving a wedge between these returns, it creates a distortion, in exactly the same manner as a tariff or other trade intervention. In this section, the simple analytics of that distortion are set forth. In Section 4, the results are then used to estimate the importance of the distortion for the Mexican economy in the years in which a nominal anchor exchange rate policy was, de facto, pursued.

Define the domestic price level as the weighted average of the prices of tradable and nontradable goods:

1). $P_d = aP_t + (1-a) P_h$

where P_d represents the domestic price level, P_t is the price of tradable goods and P_h is the price of home goods. Time subscripts are omitted.

The price of tradable goods can be expected to follow the time path of the exchange rate fairly closely:

2) $P_t = E P_w$

where E is the price of foreign exchange and P_w is the (given and assumed constant) world price of traded goods.

Since a nominal anchor exchange rate policy is, by definition, one of adjusting the nominal exchange rate less rapidly than the rate of increase of domestic prices, it follows that the domestic price of home goods must be rising more rapidly than the nominal exchange rate is depreciating; hence, for the period when a nominal anchor exchange rate policy is in effect, the domestic price of tradable goods is rising at a slower rate than the nominal

price of home goods, and thus the relative price of tradables is falling.[23]

Under any specification of production behavior, the supply of tradables will be a function of their relative price;[24] as the relative price of tradables falls over time, domestic output of tradables can be expected to fall, or at least to fail to expand as rapidly as they would at a constant relative price.[25] Of course, it may be that producers anticipate the future path of the real exhange rate, and fail to respond to the altered relative prices with which they are temporarily confronted.

When producers and consumers instantaneously adjust to current relative prices, producers will be shifting their production toward home goods while consumers will be shifting their consumption toward tradable goods.[26] Thus, as the real exchange rate

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[23]In order for the domestic rate of inflation to exceed the rate of depreciation, there must be some goods in the economy whose prices are not tied to international prices. Whether these prices are nominal wages or the prices of such nontradables as buildings, services, and transport and communications does not significantly affect the argument presented here.

[24]A complication is that the price of exportables should rise relative to import-competing and home goods, while the price of import-competing goods should fall relative to exports. However, whether the price of import-competing goods should fall relative to the price of home goods is ambiguous. On this, see Sjaastad (1980).

[25] It should be noted that, in countries where import-competing goods have been highly protected and that protection is reduced or removed, real depreciation will be warranted to offset the increased openness of the regime to imports, as well as to reduce the magnitude of imbalances in current account transactions existing at the time of policy reform.

[26]A hallmark of episodes in which nominal anchor exchange rate policies were followed has been an inflow of foreign

14

appreciates, the current account balance becomes more negative.

It is immediately evident that, regardless of whether adjustment is instantaneous or whether producers fail to respond because they anticipate real exchange rate appreciation, this trajectory is not indefinitely sustainable: increasing domestic consumption of foreign goods must be financed by accumulating liabilities to foreigners, while exportable supply is declining over time. Since the real exchange rate appreciates over time, the magnitude of the current account deficit must also increase over time.

The question immediately arises, then: how can an increasing current account deficit be sustained? Evidently, the increasing current account deficit must be offset by capital inflows. These will be encouraged under a nominal anchor exchange rate policy because the real return to foreigners for holding assets denominated in domestic currency will exceed the real return to domestic residents in the proportion of real appreciation.[27]

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capital. These inflows have appeared to finance "consumption booms", rather than increases in investment. McKinnon and Pil (1996) explain these consumption booms as resulting from the anticipation of future real income increases following policy reform; an alternative explanation, set forth in Section 2, has to do with the behavior of the real interest rate confronting domestic residents.

[27]It should be recalled that the nominal anchor policy is defined in terms of the exchange rate adjustment being less than the differential in the rate of inflation between the country in question and the rest of the world (or its relevant trading partners). For simplicity, it is being assumed that the rate of inflation in the rest of the world is zero, so that the excess of the domestic inflation rate over the rate of currency depreciation is the real appreciation of the currency.

Let i be the nominal interest rate paid to holders of assets denominated in domestic currency, p_d be the domestic inflation rate, with p_h being the rate of increase of the price of home goods. From (2), the rate of increase in the domestic price of traded goods, p_t, is:

$$3). \quad p_t = e$$

where e is the rate of nominal depreciation of the exchange rate. By definition of a nominal anchor exchange rate policy,

$$4) \quad p_t = e < p_d < p_h.$$

The real rate of interest for domestic residents, r_d, is

$$5) \quad r_d = i_d - p_d$$

Since, by construction, the worldwide rate of inflation is zero, a foreigner holding an asset denominated in domestic currency receives a nominal return,

$$6). \quad i_f = i_d - e$$

which, in the absence of foreign inflation equals the real rate of return to foreigners.

By simple algebraic manipulation of these relations, there must be a difference in the real rates of return received by foreigners and domestic residents, equal in amount to the difference between the rate of increase in the domestic price level and the rate of nominal depreciation.

$$9) \quad r_f = i_d - e; \quad r_d = i_d - p_d;$$

Therefore, the difference in the real rates of return is:

16

$$10) \quad r_f - r_d = i_d - e - i_d + p_d = p_d - e,$$

which is the rate at which the currency appreciates in real terms. Since the rate of increase in domestic prices is itself a weighted average of the rate of nominal depreciation of the currency and the rate of increase of home goods prices, foreigners receive a real return on holding local currency denominated assets that is higher than the return accruing to domestic nationals holding domestic assets by the amount of real appreciation entailed in the nominal anchor exchange rate policy (equal to $p_d - e$).

Under a nominal anchor exchange rate policy, there is no way in which foreigners and domestic residents can receive the same real return on holding an asset denominated in domestic currency.[28] Foreigners will earn a higher real return in the amount of the real appreciation of the currency.

If foreigners are willing to hold assets in the country pursuing a nominal anchor exchange rate policy to the point where the expected real rate of return equals that they can earn elsewhere in the world, then the domestic real rate of return must be _below_ the international rate if capital flows are large enough to equate domestic and foreign returns. If foreign investors base their decisions on the real return they can expect to receive in their own currency in the rest of the world, investments will be

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[28]To be sure, a domestic resident could hold a domestic asset, and, upon selling it, convert his proceeds into foreign exchange. But that is equivalent to saying that a tariff is not binding because domestic residents could always travel overseas to purchase and consume the good in question.

17

directed to activities (presumably in the home goods sector) where the real return in domestic currency (or evaluated at an equilibrium exchange rate) is below the real return in the rest of the world.[29]

The distortion, therefore, is the divergence between the real rates paid to domestic and foreign holders of assets denominated in domestic currency. One way of expressing it is that domestic borrowers will maximize subject to their perceived interest obligations, at a real rate below that actually earned by foreign lenders. As such, the real rate of interest actually paid on foreign borrowing may lie above the real rate of return earned by the domestic borrower.

Estimation of the welfare costs of such a distortion can be undertaken in two ways. One can either base the estimate on the excess capital inflow and its costs or on the current-account response to changes in the real exchange rate, following a method

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[29]   One may also examine the implications of the divergence in real interest rates for producers of tradables and nontradables. Recall that the rate of increase of prices of tradables lies below the rate of increase of the overall domestic price level. For a positive economy-wide real rate of interest, therefore, the same nominal interest rate for producers of home and traded goods must imply a higher real rate of interest (measured in terms of the
price of the producer's output) for tradables producers than for producers of home goods. Relative to an optimal allocation of capital, (i.e. one with no distortion) too little investment will be undertaken in tradable goods and too much in nontradables. Since the objectives of policy reform programs normally include the expansion of tradables, and especially exportables, output, the resource pulls arising from the differential movements of prices of tradables and nontradables lead to a result opposite from that of expansion.

suggested by Hause (1966). For a number of reasons, use of estimates based on capital account seems preferable here.[30]

Using the capital account approach, the logic of estimating welfare costs is most evident if one examines two two extreme cases: perfectly elastic, and perfectly inelastic, supply of foreign capital to the country in question. Assume first that the foreign supply of capital to a country following a nominal anchor exchange rate policy is perfectly elastic at the world real

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[30] An alternative measure of the welfare cost, examining the behavior of the current account, has been suggested by Hause (1966), who views behavior of an inappropriate real exchange rate as inducing more consumption of tradables during periods of real appreciation (relative to a constant real exchange rate) and less consumption during periods of real depreciation.

Hause shows that, to a first approximation, the welfare cost of an inappropriate real exchange rate, per period of time, is

$$(\eta/2 - \epsilon)\text{Var (RER)} (P_u T_u)$$

where $\eta/2$ is the negative (price) elasticity of demand for imports and ϵ the elasticity of supply of exports. RER is the real exchange rate, and P T is the equilibrium value of trade.

Under that analysis the welfare loss associated with the distortion in the real exchange rate comes about because individuals consume too many home and tradable goods when the real exchange rate is appreciated relative to its equilibrium level and then must curtail their consumption relative to the same equilibrium in periods where the real exchange rate is depreciated. Adjusting the estimate to allow for economic growth would constitute a significant challenge.

In Hause's analysis, excess consumption in some periods is repaid by a reduction of consumption in like amount in later periods, so that the trade balance balances over the period of the analysis (and foreign exchange reserves finance any imbalances). Since the excess interest costs are a focal point of interest in the Mexican case, and since insufficient time has passed for Mexico to repay its excess borrowing in the 1988-94 period, use of the direct capital account approach seems preferable.

19

interest rate.[31] In that event, the domestic real interest rate would lie below the international rate (and might be negative). Domestic residents would save less and invest more (presumably in nontraded goods industries - note that the real return to capital employed in tradable goods would be unaffected except as costs of domestic inputs rose more rapidly than did the price of tradables). The welfare cost of such a policy would, therefore, be the usual area under the triangle, as illustrated in Figure 1.

The left-hand panel, 1a, depicts the domestic supply of savings, S, and demand for funds for investment, D. The world real interest rate is given by r_w, and the domestic real interest rate is below the world rate by the amount of real appreciation of the exchange rate. Figure 1b gives the net demand for capital inflows as a function of the real interest rate as perceived by domestic nationals. If domestic nationals correctly perceived the world real interest rate, the inflow would be DC. However, since a lower real interest rate is perceived, investment is greater (OB), domestic saving less (OA), and the capital inflow is OJ (=AB) in Figure 1b. The triangle FHC represents the cost of the distorted real interest rate, as producers are borrowing at a true rate greater than their return on capital, while domestic consumers are spending more in the current period than they would if they were able to obtain a return equal to the world real rate of interest.

At the opposite extreme, foreigners might allocate their

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[31]The analysis would not be affected if the supply of capital were perfectly elastic at the world real interest rate plus a constant.

portfolios across countries in fixed proportions, so that the supply of foreign capital to the country were perfectly inelastic. To be sure, in this instance, optimal policy would be to impose a tax on all capital inflows, but for present purposes it suffices to estimate the welfare costs of a nominal anchor exchange rate policy contrasted with laissez-faire at an appropriate real exchange rate. In that extreme case, the entire excess payment to foreigners would represent a loss to the country in question. Figure 2 illustrates this case. There is excess demand for capital in the amount AB at the domestic real interest rate, r_d. Given the perfectly inelastic supply of capital, however, the real return to foreigners is augmented by the real appreciation of the currency. Foreign capital, which would otherwise earn the domestic real rate of return, instead earns an increment bc, equal to the rate of real appreciation of the currency. As contrasted with a laissez-faire outcome, the excess costs to domestic residents of the policy are the triangle abc, as there is more domestic investment (yielding a lower real return than the amount paid to the foreign lender) and less domestic saving than there would be if the true real return to foreigners was reflected to them.

Thus, the area under the triangle is the appropriate measure of the welfare cost of the distortion when viewed from the perspective of the capital account. In this case, the distortion in the real interest rate is easily measured by the rate of real appreciation of the exchange rate, which corresponds to DK in Figure 1 and LM in Figure 2. The base of the triangle is quite

clearly the net capital inflow less the "equilibrium rate of capital inflow". Thus, if the annual rate of real appreciation were 10 percent, while the excess capital inflow was 5 percent of GDP, the welfare cost per year of the policy would be 0.25 percent of GDP.

It is therefore evident that one can use an area-under-the-triangle estimate of the welfare cost. This is used in the next section to estimate the loss in Mexican welfare attributable to the use of the nominal anchor exchange rate policy.

4. The Costs of the Mexican Nominal Anchor Exchange Rate Policy

As already stated, Mexico followed a nominal anchor exchange rate policy after undertaking a maxidevaluation in 1987, and maintained that policy until 1994 when large capital outflows were rapidly depleting foreign exchange reserves; an attempt to stem the flow with a devaluation induced even more efforts to move out of pesos and into dollars, and the authorities finally permitted the exchange rate to float.

Table 1 gives data on the movement of the nominal and real exchange rate over the period since 1980. As can be seen, the real exchange rate[32] depreciated markedly in the aftermath of the debt crisis in 1982, appreciated during the 1983-85 period, and then once again reached a level almost 50 percent above 1980. It is significant, however, that oil prices declined sharply starting in

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[32]The real exchange rate is calculated using only Mexican and U.S. inflation rates, based on the wholesale price index. Since over 70 percent of Mexican trade is with the U.S., this seems reasonable.

1986 (which in itself would presumably have called for further depreciation), and quantitative restrictions were virtually eliminated during the 1985-1987 period. The nominal anchor exchange rate policy began in 1987. As can be seen, real appreciation was pronounced in 1988 and 1989. By 1991, the real exchange rate had reattained its 1980 level -- despite the fact that the oil price had declined sharply and that imports had been greatly liberalized. By 1993 and 1994, the real exchange rate was more appreciated than it had been at the end of 1981 -- immediately before the debt crisis.

To be sure, the rate of inflation was decreasing during the years after 1987. As can be seen in column 1 of Table 1, Mexican wholesale prices more than doubled in both 1987 and 1988; by 1989, the increase was 16 percent, and by 1994 it had fallen to 9 percent. But while the real exchange rate was appreciating at a slower rate, its level continued to reduce the relative price of tradables within Mexico.

Table 2 gives data on real GDP and on trade for the years since 1980. Real GDP grew only slowly after 1987; one wonders how much of this slow growth was the consequence of declining profitability of production of tradable goods. As can be seen, export earnings continued growing, although the average annual rate of growth of export earnings was 7.5 percent - a relatively slow rate for a country having liberalized its trade regime and counting on an outer-oriented trade strategy as a basis for growth.

Further light on the changes in the Mexican economy is shed by

the data in Table 3. As can be seen, export growth did not keep pace with GDP growth betwen 1987 and 1994: exports fell from 19.5 percent of GDP to 12.7 percent. Imports, meanwhile, boomed, rising from 13.4 percent of GDP to 17.8ß percent. As a result of these factors, the net current account deficit, which stood at -3.0 percent of GDP in 1989, rose to 7.8ß percent in 1994, the year in which the crisis resulted in December. It is significant that the net current account deficit was already over 5 percent of GDP in 1992 - which is not consistent with explanations of the Mexican difficulties of 1994 which rely on political events and expenditures surrounding the Presidential election.

The final column of Table 3 provide data on domestic savings, over the period from 1987. As can be seen, savings fell dramatically from the 1987 ratio in later years.[33] The drop after 1987 was more than accounted for by the behavior of private savings: private savings fell to around 7-8 percent of GDP in the early 1990s from a rate of 12 percent in 1989. While public savings rose somewhat, they did not rise sufficiently to offset the entire decline in private savings.[34]

There are alternative explanations of the decline in the savings ratio, although there is as yet no decisive test of their relative importance. One explanation is that the private savings

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[33]The ratio of savings to GDP had fluctuated between 21 and 25 percent in the years from 1980 to 1985. See Krueger (forthcoming).

[34]Data on public and private savings are from Sachs, Tornell and Velasco (1995) who cite the Banco de Mexico as their source.

rate fell as Mexicans went on a buying spree for newly available imported consumption goods. This is the explanation given by McKinnon and Pil (1996) more generally for large current account deficits in the aftermath of trade liberalization, and would be consistent with the Hause measure of welfare costs. An alternative explanation centers around a declining real rate of return (or profitability of investment) in tradable industries as the real appreciation of the currency continued,[35] and is more consistent with use of the capital account measure of welfare costs.

Regardless of why the domestic savings rate declined, net capital inflows clearly financed the current account deficit until 1994. It is the excess of these flows over the rates that would have taken place if the true interest cost of borrowing had been reflected that constitute the distortion, regardless of whether flows were excessive because of reduced domestic savings or increased investment beyond the point that would have been profitable had the real interest cost been reflected.[36] Tables 4 and 5 give the real returns to U. S. and Mexican holders of Mexican and U.S. Treasury bills from 1988 to 1994. In Table 4, the first

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[35]Rebelo and Vegh (1995) note that a declining ratio of private (and usually total) savings is an empirical regularity associated with nominal anchor exchange rate regimes.

[36]In the aftermath of the Mexican financial difficulties of late 1994, much was made of the bad paper in the portfolios of Mexican banks. It would be of interest to calculate how much of that bad paper was a result of dollar-denominated debts that could have been serviced at the nominal anchor exchange rates but not at a realistic exchange rate.

25

column gives the Mexican Treasury bill rate.[37] As can be seen, the nominal rates were declining as inflation fell in Mexico. The second column gives the peso depreciation during the year in question. The third column then gives the nominal returns to U.S. nationals from holding either Mexican T-bills (column 3) or U.S. T-bills (column 4). As can be seen, the dollar return realized for holding Mexican T-bills was above that for holding U.S. bills in each year until 1994.

Table 5 then gives the nominal and real returns to Mexicans for holding U.S. and Mexican treasury bills. As can be seen, the real returns to Mexicans were negative in all years up to 1994, except for 1989, for holding U.S. T-bills; the real return for holding Mexican bills was positive (though declining over time) for holding Mexican T-bills. Comparison, however, of the real returns to U.S. nationals for holding Mexican securities were always above those accruing to Mexicans from holding the same securities.[38]

The question then is, what was the welfare cost to the Mexican economy of this distortion? Using the capital account measure,

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[37] The Mexican government did not permit the sale of Mexican government securities to foreigners until July 6, 1989 when sales of bondes, tesobonos and adjustabonos were permitted. In December, 1990, restrictions on the sale of CETES were also lifted. One can wonder whether, given the high real rates of return available, foreigners were able to acquire these securities through other means.

[38] The total nominal return in dollars to a U.S. national from holding Mexican Treasury bills from 1988 to the beginning of 1995 (and therefore after the 1994 crash) was 146 percent; holding a U.S. Treasury bill over the same period provided a total return of 45 percent. Thus, even with the crash of 1994, investors who held Mexican securities throughout the period nonetheless gained contrasted with the U.S. T-bill alternative.

Table 6 provides the calculations. Column 1 gives the U.S. bank lending rate for the year in question, as a standard for comparison. The distortion in the interest rate was presumably the percentage rate of real appreciation, given in column (2) of Table 6. The difficult question is what the appropriate quantity of capital inflow is, relative to what it would have been. On one hand, Mexicans were paying the lower interest rate on all their outstanding borrowing; on the other hand, it can be argued that only the current year's current account deficit mattered for purposes of determining any given year's distortion cost. Even then, the question is what the level of capital inflow would have been had a different exchange rate policy have been followed. The estimate provided here is, in a sense, a compromise. All of the current account deficit is taken to have resulted from the nominal anchor exchange rate policy, but only each year's current account deficit is counted when estimating the welfare cost.[39]

As can be seen, welfare costs on this basis are estimated at more than a quarter of a percent of GDP for each of the years 1991 to 1994. The estimate is based on the size of the current account deficit,[40] multiplied by one half times the interest rate

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[39]If instead it were argued that, for example, half of all borrowing resulted from the perceived lower interest rate, one would multiply the figures in Column (2) by half of all outstanding Mexican debt times the ratio of debt to GDP times one half - a significantly larger number.

[40]To the extent that direct foreign investment in home goods industries received excessive returns denominated in dollars, it can be argued that the welfare cost may have been even higher than the use of the U.S. interest rate would indicate.

distortion. Had U.S. interest rates not declined in the early 1990s, the estimated cost would have increased even more sharply.

Because the estimate is applied only to the year's current account deficit, rather than outstanding foreign exchange liabilities, it is probably a significant understatement of the true welfare costs of the policy. Even so, a quarter or a third of a percent of GDP is not a small number, especially when one asks what the benefits of the policy may have been -- given the inflation that ensued with the collapse of the peso and the adjustment costs associated with it.

4. Conclusions

A nominal anchor exchange rate policy -- for as long as it persists -- discriminates against tradables and in favor of production of home goods, while providing incentives for increased domestic consumption of tradables. Simultaneously, a capital inflow induced by the premium earned by foreign investors because of the nominal anchor exchange rate policy can enable the policy to persist. However, the real rate of return paid to foreigners is too high relative to the marginal product of capital in home goods industries (evaluated at constant prices), and a distortion results, with attendant real costs.

Use of a nominal anchor exchange rate policy is fraught with difficulties. Foremost among them is the inevitability of the collapse of the regime when reserves are sufficiently reduced so that agents are no longer willing to bet on the continuation of the regime. On the basis of the data on the Mexican exchange rate, the

28

question should not be why there was a run on the peso at the end of 1994; the more relevant question is how the authorities managed to maintain the policy so long!

Even if an exit from a nominal anchor exchange rate policy can be managed prior to a breakdown of the regime, however, there are serious questions about the policy. Clearly, the realignment of production toward the international economy will be retarded, if not entirely postponed, during the period when a nominal anchor holds sway. As such, the growth objectives of policy reform are certainly to be at least partially thwarted.

In addition, however, there are real costs to the policy. As long as it is in effect, it is equivalent to a subsidy on foreign investments in local assets, in that foreigners are assured a real return above that in domestic currency.

While these considerations are not sufficient to conclude that a nominal anchor exchange rate policy should never be used, they do add to the weight of the evidence in favor of avoiding such a policy if at all possible. In societies where the costs of inflation are sufficiently high, and the domestic currency has lost all credibility, however, it is possible that very large benefits of controlling inflation may outweigh the very high costs of a nominal anchor exchange rate policy. Unless circumstances are truly exceptional, however, it is doubtful whether a nominal anchor exchange rate policy can be warranted.

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Table 1. Mexican Nominal and Real Exchange Rates

1980 to 1995.

	Wholesale Price Index (1990=100)	Nominal Exchange Rate per U.S. $	Real Exchange Rate (1980=100)	Nominal Interest Rate (%)
1980	0.7	0.0230	100.0	20.63
1981	0.9	0.0245	93.7	29.56
1982	1.4	0.0564	140.8	43.62
1983	2.9	0.1201	146.3	54.70
1984	4.9	0.1678	122.8	43.86
1985	7.6	0.3569	121.9	59.48
1986	14.3	0.6118	149.5	84.68
1987	33.6	1.3782	146.8	97.24
1988	69.8	2.2731	121.1	63.65
1989	81.1	2.4615	118.5	36.29
1990	100.0	2.8126	113.6	31.24
1991	120.5	3.0184	101.4	17.10
1992	136.7	3.0949	92.2	15.68
1993	148.8	3.1156	86.5	15.46
1994	158.9	3.3751	87.8	13.26
1995	221.1	6.4194	124.3	39.18

Source: International Monetary Fund, <u>International Financial Statistics</u>, 1995 Yearbook and April 1996.

Notes: 1) Nominal exchange rates are new pesos per U.S. dollar for the end-of-period average.

2). The real exchange rate was calculated between the peso and the U.S. dollar (with whom Mexico does more than 70 percent of her trade). The real exchange rate was calculated as the nominal exchange rate times the U.S. producer price index divided by the Mexican wholesale price index.

Table 2. Mexican Real GDP and Trade Variables

	Real GDP	Merchandise		Current Account Balance
		Exports	Imports	
		(billions	of U.S.	dollars)
1980	586.1	15.5	18.9	-10.8
1981	621.6	20.1	23.9	-16.1
1982	629.1	21.2	14.4	-6.3
1983	602.7	22.3	8.6	5.4
1984	624.5	24.1	11.3	4.2
1985	640.7	21.7	13.2	1.1
1986	616.6	16.0	11.4	-1.7
1987	628.1	20.7	12.2	4.0
1988	635.9	20.5	20.3	-2.3
1989	657.2	22.8	25.4	-5.8
1990	686.4	26.8	31.2	-7.4
1991	711.3	26.9	38.2	-14.9
1992	731.3	27.4	48.1	-24.4
1993	735.6	30.0	48.9	-23.4
1994	761.7	34.6	58.9	-29.8

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Sources: IMF International Financial Statistics, 1995 Yearbook.

Notes: Real GDP is in billions of 1990 pesos.

Table 3. Structural Changes in the Mexican Economy, 1987-94

	Exports/ GDP	Imports/ GDP	Net Current Account/GDP (%)	Domestic Savings as % of GDP
1987	.195	.134		22.0
1988	.168	.153		19.3
1989	.160	.162	-2.6	18.8
1990	.158	.169	-2.7	19.2
1991	.138	.170	-4.6	17.8
1992	.126	.181	-6.7	16.1
1993	.124	.167	-6.8	16.7
1994	.131	.189	-7.9	15.8

Source: Banco do Mexico, 1994.

Table 4. Nominal and Real Returns to U.S. Holders of U.S.
and Mexican Treasury Bills, 1988-1994.

Year	Mexican Treasury Bill Rate (%)	Peso depreciation (%)	U.S. Return	U.S. Bill Rate
1988	69.2	3.2	64.0	6.7
1989	45.0	15.8	25.2	8.1
1990	34.8	11.5	20.9	7.5
1991	19.3	4.3	14.4	5.4
1992	15.6	1.4	14.0	3.5
1993	15.0	-0.3	15.3	3.0
1994	14.1	71.4	-33.4	4.3

Source: IMF International Financial Statistics, 1994 Yearbook and
August 1995, country pages. U.S. return on holding Mexican T-bills
is one plus the nominal rate divided by one plus the rate of
depreciation.

Table 5. Real Returns to Mexican Nationals from Holding

U.S. or Mexican T-bills for One Year
(percentage)

Year	Nominal Returns to Mexicans U.S. T-bills	Holding Mexican T-bills	Mexican Inflation Rate	Real Returns to Mexicans U.S. T-bills	Holding Mexican T-bills
1988	10.1	69.2	20.2	-8.4	40.8
1989	25.2	45.0	26.7	-1.2	14.4
1990	19.9	34.8	22.7	-2.3	9.9
1991	9.9	19.3	15.5	-4.8	3.3
1992	4.9	15.6	9.7	-4.4	5.4
1993	2.7	15.0	6.9	-3.9	7.6
1994	78.8	14.4	35.0	32.4	-15.5

Sources: International Monetary Fund and Banco de Mexico.
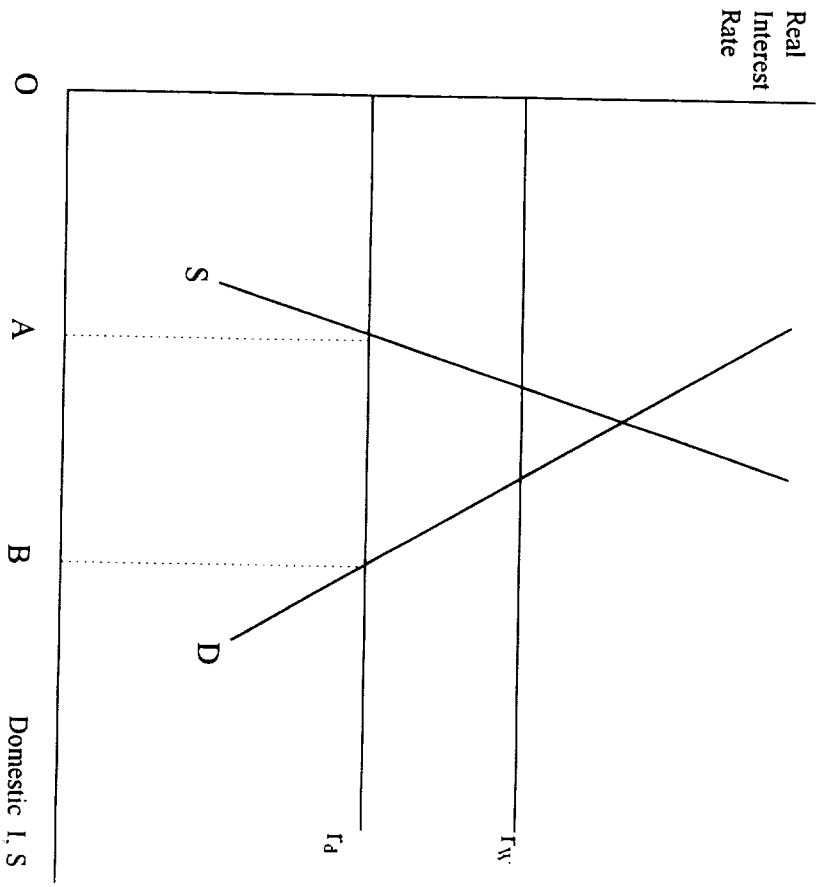
Notes: 1. The Mexican inflation rate is the rate of increase in the consumer price index calculated from International Financial Statistics.

2. Nominal returns to Mexican holders of U.S. T-bills were calculated as the nominal interest rate in U.S. dollars adjusted by the rate of peso depreciation. The relevant Mexican inflation rate is taken to be the rate for the year over which the bonds are assumed to be held.
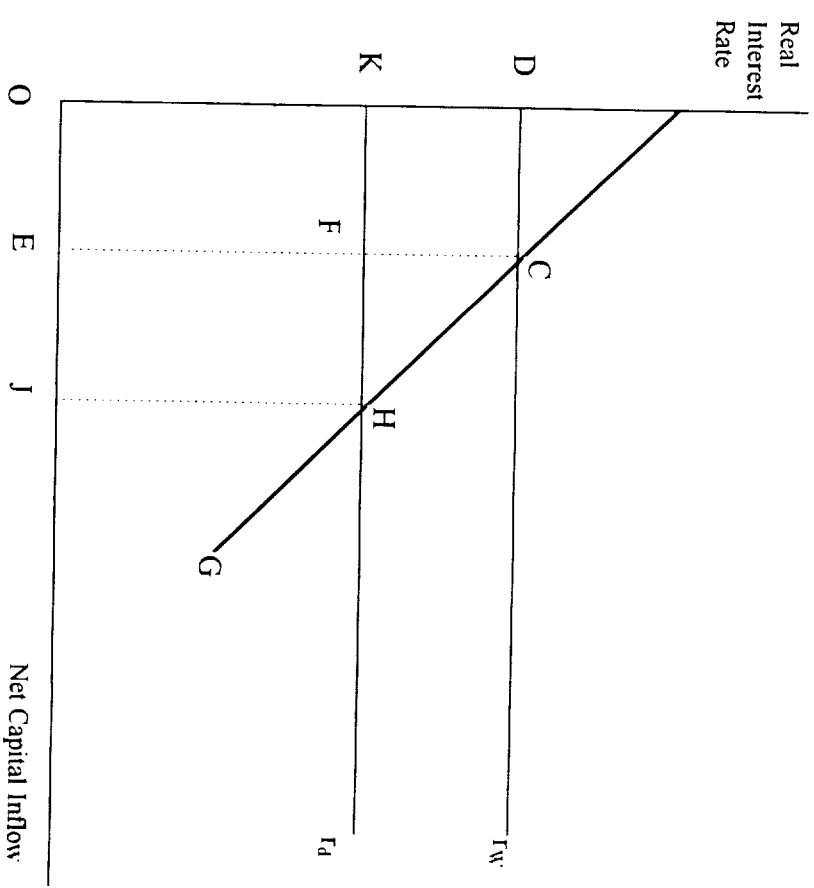
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Table 6. Alternative Measures of

the Welfare Cost of Nominal Anchors

	U.S. Bank Lending Rates (%)	Peso Real Appreciation (%)	Current Account Deficit (% of GDP)	Welfare Cost (as a % of GDP)
Year	(1)	(2)	(3)	(4)
1988	9.32	17.5	-1.4	0.12
1989	10.92	2.1	-2.9	0.03
1990	10.01	4.0	-3.1	0.06
1991	8.46	10.8	-5.2	0.28
1992	6.25	9.0	-7.6	0.34
1993	6.00	6.2	-6.5	0.20
1994	7.14	-2.8	-7.8	na

Sources: International Monetary Fund, _International Financial Statistics_, 1996 Yearbook; peso real appreciation is calculated from Table 1; current account deficit is from Table 3; and Table 4 is calculated as column (2) x column (3) x 0.5.
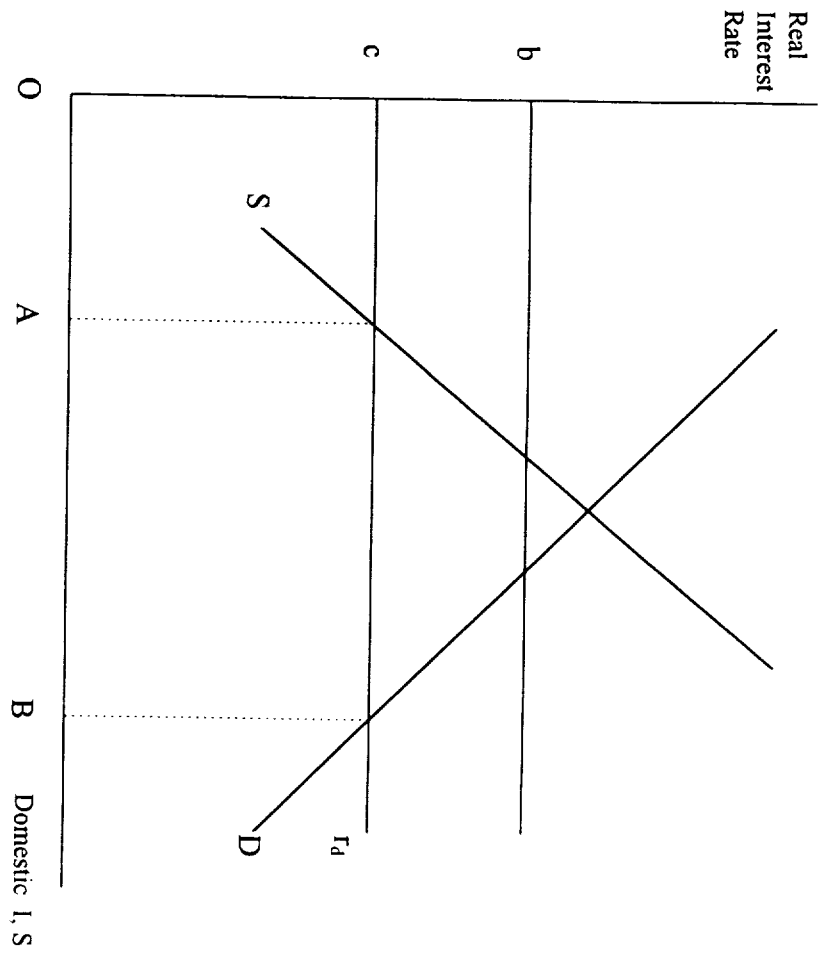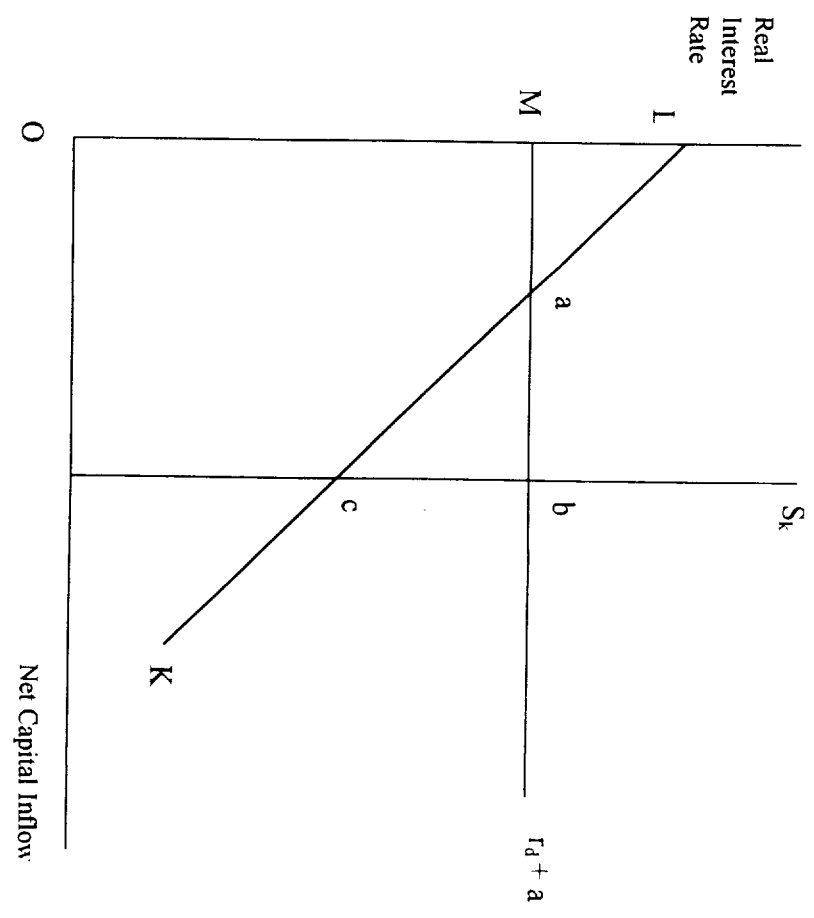
1a.

Real Interest Rate

O · A · B · Domestic I, S

Curves labeled: S, D, r_d, r_w

1b.

Real Interest Rate

O · E · J · Net Capital Inflow

Points labeled: K, D, F, C, H, G

Curves labeled: r_d, r_w

Figure 1: Welfare Cost of Nominal Anchor Exchange Rate: Perfectly Elastic Supply of Foreign Capital

Real
Interest
Rate

b

c

O   A   B   Domestic I, S

S

r_d

D

2a.

Figure 2

Real
Interest
Rate

L

M

O

a

b S_k

c

K

$r_d + a$

2b.

Net Capital Inflow